

ARCTIC COLLABORATIVE ENVIRONMENT: A NEW MULTI-NATIONAL PARTNERSHIP FOR ARCTIC SCIENCE AND DECISION SUPPORT

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1. INTRODUCTION

The Earth's ice cover exhibits an enormous influence on global climate through the regulation of energy and moisture exchanges between the ocean, atmosphere, and land; and through the potential of the great ice sheets to raise sea level dramatically. History and projections of global climate suggest that the high-latitude ice-covered regions of the Earth, particularly the Arctic, have high sensitivity to climate change. The polar regions of Earth have been experiencing rapid change. In some parts of the Arctic, wintertime average temperatures have climbed as much as 4°C since the 1950's, several times greater than the average global pace. Extensive melting and dynamic thinning has been observed of the Greenland ice sheet. Much of the permafrost present for centuries appears to be thawing releasing methane and other gases. The Arctic Basin is ice free for longer periods each year and on average sea ice is 15% thinner than 50 years ago. Taken together, these data suggest a faster-than-expected response to global warming.

Under the auspices of the 2010 International Polar Year (IPY), Arctic nations have made key investments in monitoring the Arctic region to enhance understanding of this rapidly changing region. As a result of the IPY activities, there is strong interest in improving data sets, models, and decision-making tools related to key scientific processes and management of assets of the Arctic region. Deficiencies in these areas contribute to slower than acceptable pace of equipping and training partner nations to address environmental and resource management issues in the Arctic. Further, this results in partnership operational shortfalls and inconsistent regional and national institutionalization / utilization of data products and model outputs. The Arctic Collaborative Environment (ACE) project will address the challenge of establishing international partnerships for information needs at the appropriate spatial and temporal scales. The goal of ACE is to create an open source, web-based, multi-national monitoring, analysis, and visualization decision-support system for Arctic environmental assessment, management, and sustainability. Monitoring and predicting change in sea ice extent

and condition and for improved monitoring of real-time changes in the permafrost and the associated release of methane are two high priority topics.

2. SCIENCE AND ENGINEERING ARCHITECTURE

ACE is modeled after SERVIR, a proven NASA project operational in Central America and East Africa, which empowers local users at globally-distributed nodes with the hardware and software tools necessary to integrate satellite observations, ground-based data and forecast models to monitor and forecast environmental changes and to improve response to natural disasters. Likewise, ACE will establish a regional node in the U.S. and national and remote access user nodes at partner nations with Arctic interests to enable scientists and educators improved ability to study the Arctic's response to climate change and to enable project managers and policy implementers better responds to a range of issues including transportation and mobility, emergency management, construction of off shore oil rigs or pipelines, optimal conditions and routes for Inuit hunting and fishing (Fig. 1). Nodes will be equipped to provide access to raw data resources, processing and computational resources, access to analytical data and model output and data sharing capabilities with partners.

3. IMPLEMENTATION PLAN

ACE will be initiated with funding from the United States government and be managed by NASA Marshall Space Flight Center. A Regional Node is under development and will temporarily be housed at the National Space Science and Technology Center (NSSTC) in Huntsville, Alabama. User Requirements and Product Development Working Groups have been established and are active in providing definition to ACE. The team is working to secure participation of Canada (Canadian Ice Service), Russia, Germany, Norway, and other Arctic nations. The number and extent of National Nodes in these and other nations at the outset is still under review and are part of the negotiations with the proposed international partners. The ACE team has socialized these activities with the National Oceanic and Atmospheric Administration (NOAA) and has submitted formal proposals to Canada and Russia. In addition to identifying user requirements, system capabilities, and product development needs, the initial phase of the ACE Project also will include setting up multiple Remote Access User sites.

The ACE project team has identified a broad set of users including National Navies and Coast Guards; regional, national and local governments with territorial claims in the Arctic region; Inuit and Aleut Tribes and Local Jurisdictions; Commercial Shipping; and the Arctic Science Research Community. The initial set of common functions executed by these groups include maritime safety; maritime and on-ice search and rescue; Economic Exclusion Zone (EEZ) management; strategic movement; in-situ mobility; infrastructure design and development; coastal zone mapping; hydrographic surveys; environmental management; inter-agency and international

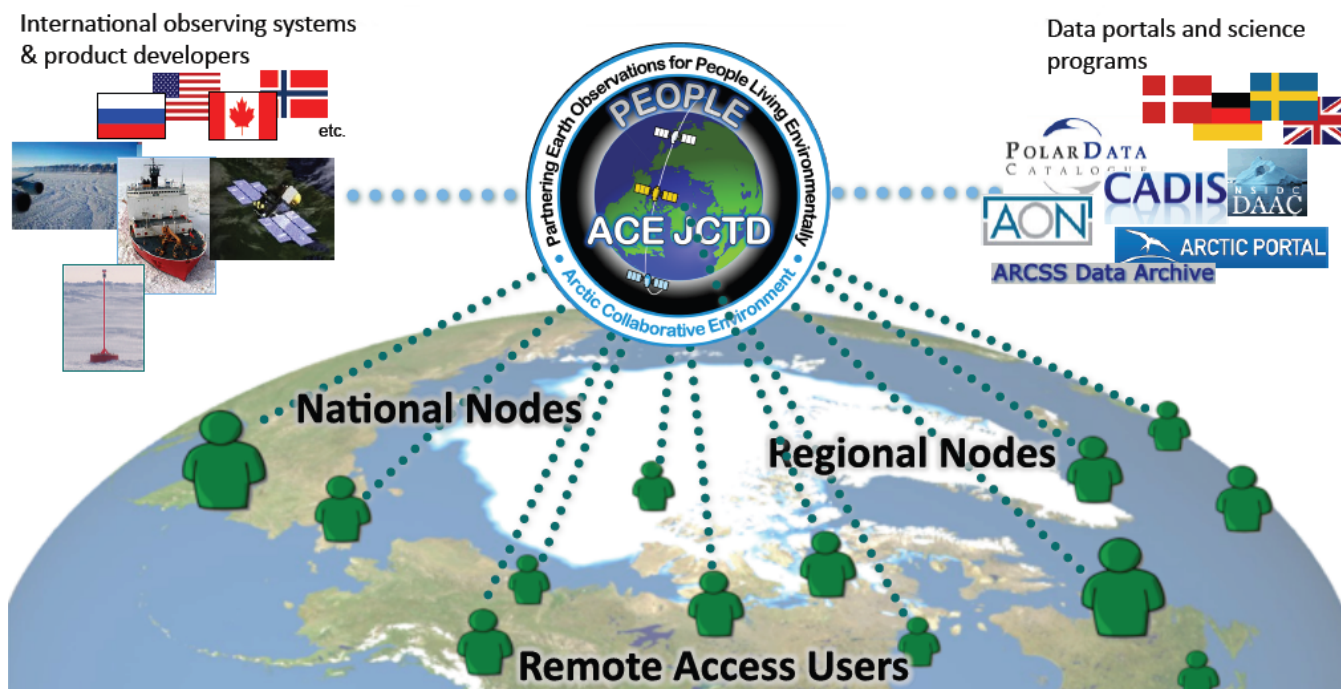


Fig. 1. The Arctic Collaborative Environment concept of linking partner nations through open-source data exchange to address Arctic environmental management and sustainability.

cooperation; and scientific research. Based on preliminary inputs from these groups, two topics have emerged as high priorities, sea ice and permafrost.

At the end of Year 1, ACE will conduct an operational demonstration of its developing capabilities. At the conclusion of this activity, the Regional Node will be relocated to the Sustained Arctic Observing Network (SAON) at the National Ice Center, which is a collaboration between NOAA, U.S. Navy, and U.S. Coast Guard. The node at the NSSTC will remain the foci for developing and prototyping additional capabilities.

4. SUMMARY

The Arctic Collaborative Environment (ACE) project is a new international partnership for information sharing to meet the challenges of addressing Arctic. The goal of ACE is to create an open source, web-based, multi-national monitoring, analysis, and visualization decision-support system for Arctic environmental assessment, management, and sustainability. This paper will describe the concept, system architecture, and data products that are being developed and disseminated among partners and independent users through remote access.